SOE 15: Traffic Dynamics, Urban and Regional Systems

Time: Wednesday 17:00–18:15 Location: H11

SOE 15.1 Wed 17:00 H11

Gravity Model in Estimating Park Visitation Pre and during COVID-19 Pandemic — Zahra Ghadiri[1], Afra Mashhadi[2], and •Fakhteh Ghanbarnejad[1,3] — [1]Department of Physics, Sharif University of Technology, Tehran, Iran — [2]Computing and Software Systems, University of Washington, Bothell, WA, USA — [3]Chair for Network Dynamics, Institute for Theoretical Physics and Center for Advancing Electronics Dresden (cfaed), Technical University of Dresden, 01062 Dresden, Germany

The COVID-19 pandemic and the resulting economic recession have negatively affected many people's social, and psychological health. Parks may have ameliorated the negative effects of the pandemic by creating opportunities for outdoor recreation. At the same time, other public activities were restricted due to the risk of disease transmissions. In our study, we seek to improve our understanding of how the COVID-19 pandemic impacts park visitations by performing a longitudinal study based on the aggregated telecommunication data. To do so, we introduce a novel approach based on the Gravity Model to understand, quantify and model the relationship between distance and the visitation patterns. Particularly, we aim to find out how the park visitation behavior changes post-pandemic and how this change of visitation varies for different socio-economic groups of visitors. Our results show that the park visitation pattern in Washington state (U.S.A) obeys the gravity law. Moreover, we show that, although parameters of the model may vary, the gravity model can still accurately estimate the visitation after applying socio-economic and spatial filters.

SOE 15.2 Wed 17:30 H11

Bimodal transport: Making door-to-door transport sustainable and convenient — •Puneet Sharma[1,2], Helge Heuer[1], Steffen Muehle[1], Stephan Herminghaus[1,2], and Knut Heidemann[1] — [1]Max Planck Institute for Dynamics and Self Organization, Goettingen — [2]Georg-August-Universität Göttingen

Decarbonization of passenger transport is essential for fighting climate emergency. While modern cities offer various modes of transportation, considered separately, none of them is both, sustainable and convenient. A taxi service is convenient, in a sense, due to door-to-door service, but is inefficient since it usually serves one customer only. Demand-responsive ridepooling (DRRP) with minibuses is more efficient, but leads to undue competition with line services (LS), which provide even better pooling but are less convenient due to fixed routes and stops. A combination of both modes, DRRP and LS, may provide an ideal solution but is challenging to organize. Here we introduce a model for such bimodal on-demand transportation based on a square-grid geometry. Our model quantifies under what circumstances bimodal public transportation is feasible, both in terms of convenience and ecological footprint. Moreover, the model yields estimates for how to operate (LS frequency, modal split) a bimodal transportation system optimally. Perhaps surprisingly, we find that operating LS at maximum capacity is not necessarily optimal. We also consider the intricate interplay between LS operations and DRRP performance, i.e., detours, waiting times, and occupancy, via simulations.

SOE 15.3 Wed 17:45 H11

Urban road networks: Geometric characteristics and generative models — •Reik Donner — Hochschule Magdeburg-Stendal, Magdeburg, Germany — Potsdam Institute for Climate Impact Research, Potsdam, Germany

Urban road networks provide the spatial backbone of the development of cities. As planar networks, they possess characteristic size, shape and orientation distributions of their basic constituting elements (road segments and cellular structures). Comparisons with simple benchmark planar graph models show that the latter commonly fail to mimic those characteristic features of the real-world networks, including heavy-tailed object size distributions, specific shapes of node and cell degree distributions, and the predominant orthogonality of street patterns. In order to account for these discrepancies, I introduce a hierarchy of planar network models combining the successive evolution of the network with a perpendicular splitting of road segments controlled by a spatial potential function. The resulting model networks can be used as benchmarks for generating *surrogate cities* for further testing dynamical models of urban traffic.